Claims

1. A DNA construct comprising a replication system recognized by a unicellular microorganism and a DNA sequence coding for at least 20 bp of a human immunodeficiency virus (HIV) genome.

2. A DNA construct according to claim 1, wherein said DNA sequence includes substantially the entire HIV genome, is of at least about 9 kbp, and said unicellular microorganism is yeast or bacteria.

3. A DNA construct according to claim 2, wherein said DNA sequence is substantially as set forth in Figures 4, 5, 8, 9, 10, 11, 12, or 15.

4. A DNA construct according to claim 1, wherein said DNA sequence does not duplex with HTLV-I or HTLV-II nucleic acid sequences under stringent hybridization conditions, but does duplex with an HIV-1 nucleic acid sequence under said stringent hybridization conditions.

5. A DNA construct according to claim 4, wherein said DNA sequence is homologous to a nucleotide sequence in the gag, env, or pol regions of an ARV-2 isolate.

6. A DNA construct comprising a replication system recognized by a unicellular microorganism and a DNA sequence of at least about 21 bp having an open reading frame and having a sequence substantially complementary to a sequence found in the gag, env, or

pol region of an HIV, coding for a polypeptide which is immunologically non-cross-reactive with HTLV-I and HTLV-II, and reactive with HIV.

7. A DNA construct according to claim 6, wherein said DNA sequence is substantially a complete gene located in the pol region.

8. A DNA construct according to claim 7 wherein said gene is reverse transcriptase.

9. A DNA construct according to claim 6, wherein said sequence is substantially a complete gene located in the env region.

10. A DNA construct according to claim 6 wherein said sequence is substantially complementary to gp120env or gp41env.

11. A DNA construct according to claim 6, wherein said sequence is substantially a complete gene located in the gag region.

12. A DNA construct according to claim 6, wherein said DNA sequence is substantially as set forth in Figures 8, 9, 10, 11, 12, or 15.

13. A restriction endonuclease fragment of at least about 1.5 kbp derived from restriction enzyme digestion by at least one restriction endonuclease of a DNA sequence coding for a human immunodeficiency (HIV) virus of the class HIV-1.

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14. A restriction endonuclease fragment according to claim 13, wherein said restriction endonuclease is at least one of EcoRI, EcoRV, SstI, SacI, KpnI, SphI, PstI, HindIII and BglII.

15. A restriction endonuclease fragment according to claim 14 wherein the digestion is with: EcoRI and KpnI; SacI and EcoRV; SacI and BglII; or KpnI and SstI.

16. A DNA sequence comprising a fragment of at least about 20 bp, wherein the strands are complementary to a restriction endonuclease fragment according to claim 13, said sequence duplexing with an HIV nucleic acid sequence and not duplexing with HTLV-I or HTLV-II nucleic acid sequence under selective hybridization conditions.

17. A DNA sequence which is synthesized and is complementary to a DNA sequence according to claim 14.

18. A DNA construct comprising a DNA sequence of at least about 20 bp encoding an amino acid sequence homologous to an amino acid sequence of a human immunodeficiency virus (HIV), and a replication system recognized by a unicellular organism.

19. A method for detecting the presence of a human immunodeficiency virus (HIV) nucleic acid sequence present in a nucleic acid sample obtained from a physiological sample, which comprises:

(a) combining said nucleic acid sample with a single-stranded nucleic acid sequence of at least about

20 bases complementary to a sequence in said HIV single-stranded sequence not forming a duplex with and non-cross-reactive with HTLV-I and -II nucleic acid sequences under conditions of predetermined stringency for hybridization; and

(b) detecting duplex formation between said single-stranded nucleic acid sequence and nucleic acid present in said sample.

20. A method for cloning DNA specific for HIV, which comprises:

(a) providing a DNA construct according to claim 1; and

(b) growing a unicellular microorganism containing said DNA construct under conditions whereby said DNA sequence is replicated.

21. A method for producing an expression product of a human immunodeficiency virus (HIV) which comprises:

(a) transforming a unicellular microorganism host with a DNA construct having transcriptional and translational initiation and termination regulatory signals functional in said host and an HIV DNA sequence of at least 21 bp having an open reading frame and under the regulatory control of said signals; and

(b) growing said host in a nutrient medium, whereby said expression product is produced.

22. A method according to claim 21, wherein said sequence encodes at least a portion of a gag gene, a pol gene, or an env gene.

23. The method according to claim 21 wherein the sequence is an ARV sequence and encodes p16gag, p25gag, a fusion protein of p16gag and p25gag, env protein, a fusion protein of a gag protein and env protein, a fusion protein of env protein and B-galactosidase, p31pol, a fusion protein of p31pol and superoxide dismutase, env-2 protein, env-5b protein, or a fusion protein of env-5b and superoxide dismutase.

24. The method according to claim 21, wherein the DNA sequence is substantially as set forth in Figures 4, 5, 8, 9, 10, 11, or 12.

25. A method according to claim 21, wherein said transcriptional initiation regulatory signals are ARV regulatory signals.

26. A method for producing an expression product of a human immunodeficiency virus (HIV) which comprises growing mammalian host cells having a DNA construct comprising transcriptional and translational initiation and termination regulatory signals functional in said host cells and a DNA sequence of at least 21 bp and less than the whole HIV genome, said sequence having an open reading frame and an initiation codon at its 5'-terminus and under the transcriptional and translational control of said regulatory signals, whereby a polypeptide encoded by said sequence is expressed.

27. A method of detecting antibodies to HIV in a sample suspected of containing said antibodies comprising:

(a) providing a support with at least one antigenic recombinant HIV polypeptide bound thereto;

(b) contacting said sample with said support-bound polypeptide;

(c) washing the support;

(d) contacting the support with labeled antibody to human immunoglobulin; and

(e) detecting the presence of said antibodies to HIV on said support via said label.

28. The method of claim 27 wherein said support is the surface of a microtiter plate well or a strip of material that binds polypeptides.

29. The method of claim 27 wherein at least one antigenic recombinant HIV-1 gag polypeptide and an antigenic recombinant HIV-1 env polypeptide is bound to the support.

30. The method of claim 27 wherein said antigenic recombinant polypeptide is a gag polypeptide.

31. The method of claim 30 wherein said gag polypeptide is p25gag.

32. The method of claim 30 wherein said gag polypeptide is p16gag.

33. The method of claim 30 wherein said polypeptide is p41gag.

34. The method of claim 27 wherein said antigenic recombinant polypeptide is an env polypeptide.

35. The method of claim 34 wherein said env polypeptide is gp120 polypeptide.

36. The method of claim 35 wherein said gp120 polypeptide is env-2.

37. The method of claim 34 wherein said env polypeptide is gp41.

38. The method of claim 37 wherein gp41 is env-3.

39. The method of claim 34 wherein said env polypeptide is a transmembrane portion gp41.

40. The method of claim 39 wherein said transmembrane portion is env-5b.

41. The method of claim 40 wherein said transmembrane portion is SOD-env-5b.

42. The method of claim 27 wherein said antigenic recombinant polypeptide is a pol polypeptide.

43. The method of claim 42 wherein said pol polypeptide is p31pol.

44. The method of claim 42 wherein said pol polypeptide is a SOD-p31pol fusion polypeptide.

45. The method of claim 42 wherein said pol polypeptide is HIV reverse transcriptase.

46. The method of claim 27 wherein said support has bound thereto antigenic HIV polypeptides

from at least three regions, and said regions comprise the gag, env and pol regions.

47. The method of claim 46 wherein said antigenic polypeptides comprise p25gag, env, and SOD-p31pol.

48. The method of claim 46 wherein said antigen polypeptides comprise p25gag, gp120env, gp41env, and p31pol polypeptides.

49. The method of claim 48 wherein said gp41env polypeptide is the transmembrane portion thereof, and said p31pol polypeptide is a fusion protein.

50. The method of claim 27 wherein the label is an enzyme and said detecting involves contacting the support with a substrate solution and reading the activity of the enzyme on said substrate solution.

51. The method of claim 50 wherein the support is the surface of a microtiter plate well or a strip of protein-binding material and a gag polypeptide, an env polypeptide, and a pol polypeptide are bound to said support.

52. The method of claim 51 wherein p25gag, gp120env, the transmembrane portion of gp41env, and p31pol polypeptides are bound to the support.

53. A recombinant HIV polypeptide selected from the group consisting of:

(a) p16gag;

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(b) p25gag;
(c) an env polypeptide;
(d) p31pol;
(e) a fusion protein of p16gag and p25gag;
(f) a fusion protein of a gag protein and an env polypeptide;
(g) a fusion protein comprising an env sequence; and
(h) a fusion protein comprising p31pol.

54. A recombinant HIV polypeptide selected from the group consisting of:
(a) gp120env;
(b) gp41env;
(c) a fusion protein of superoxide dismutase and env-5b; and
(d) HIV reverse transcriptase.

55. An article of manufacture for use in an assay for HIV antibodies comprising at least one polypeptide of claim 53 bound to a solid support.

56. An article of manufacture for use in an assay for HIV antibodies comprising at least one polypeptide of claim 54 bound to a solid support.

57. A method of producing antibodies in a mammal comprising administering to said mammal a composition comprising an antigenically effective amount of a recombinant HIV polypeptide.

58. The method of claim 57 wherein said HIV polypeptide is an env polypeptide.

59. A vaccine composition comprising a recombinant HIV polypeptide.

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